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Self-Interacting Gas in a Gravitational Wave Field

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Abstract

We investigate a relativistic self-interacting gas in the field of an external pp gravitational wave. Based on symmetry considerations we ask for those forces which are able to compensate the imprint of the gravitational wave on the macroscopic 4-acceleration of the gaseous fluid. We establish an exactly solvable toy model according to which the stationary states which characterize such a situation have negative entropy production and are accompanied by instabilities of the microscopic particle motion. These features are similar to those which one encounters in phenomena of self-organization in many-particle systems.

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Keywords

Gravitational wave, Kinetic theory, Many-particle system